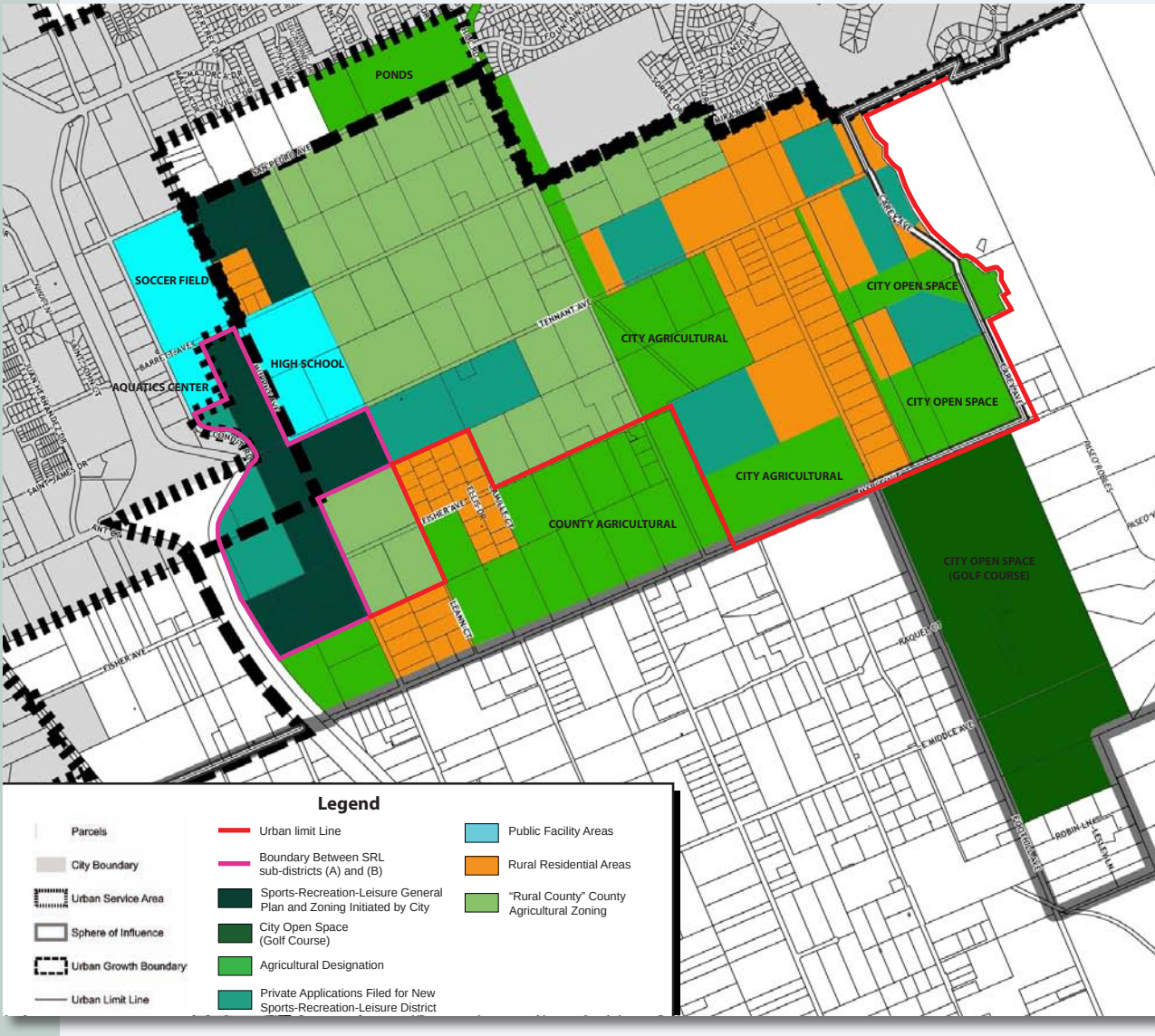
Appendix H: Transportation Impact Analysis

Final Transportation Impact Analysis

South-East Quadrant General Plan Amendment



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December 13, 2013

Final Transportation Impact Analysis
South-East Quadrant
General Plan Amendment

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First Carbon Solutions - Michael Brandman Associates

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SJ09-1139

FEHR PEERS

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1.0 INTRODUCTION

This report presents the results of the transportation impact analysis (TIA) of the proposed City of Morgan Hill South-East Quadrant (SEQ) General Plan Amendments, Agricultural Mitigation and Preservation Program, and South County Catholic High School (High School) also referred to as the SEQ Area Project. The SEQ Area is located in unincorporated Santa Clara County along the southeastern city limit boundary of the City of Morgan Hill (See **Figure 1**). The approximately 1,290-acre SEQ Area is generally bounded by Condit Road and US 101 to the west, San Pedro Avenue to the north, Carey Avenue to the east, and Maple Avenue to the south. The proposed High School site is located within the western portion of the SEQ Area. The 38-acre High School site is bounded by Tennant Avenue on the south, Murphy Avenue on the west, Barrett Avenue on the north, and agricultural land to the east.

At buildout, the High School would include approximately 65 classrooms to accommodate up to 1,600 students. Other facilities would include a gymnasium, library, theater, music, chapel, track and field, sports fields, and baseball/basketball/tennis courts. The proposed school structures would encompass a total of 146,770 square feet. The first phase would accommodate 600 students over a 5-year timeframe. Sports fields and facilities would be developed in the later phases. The applicant may propose interim, joint use of nearby City aquatics and athletic field facilities for the time before the school's sports facilities are available. This report evaluates full buildout of the 1,600-student High School at a project-level.

Current planning activities for the remainder of the 1,290-acre SEQ Area are intended to guide future development and land use activities within the project area boundaries. The City is exploring the potential of private commercial sports/recreation/leisure and other uses within a portion of the SEQ Area and Agriculture and Open Space uses. The following components are evaluated at a program-level:

- General Plan Amendment – Establishment of new Sports-Recreation-Leisure land use designation, re-designation of land uses within the SEQ Area, and establishment of agricultural related policies
- Zoning Code Amendment – Establishment of a Sports-Recreation-Leisure Zoning District
- Boundary Updates – Update city limits, urban service area, urban growth boundary and urban limit line.
- Agricultural preservation policies, conversion policies, and mitigation.
- Open Space Program – Establishment of program to support city/public/non-profit ownership of identified agricultural/open space within the SEQ Area.

The purpose of the TIA is to identify potential significant adverse impacts of the High School and SEQ Area Project on the surrounding transportation system and to recommend mitigation measures, if

needed. Impacts are evaluated following the guidelines of the City of Morgan Hill and the Santa Clara Valley Transportation Authority (VTA), the congestion management agency for Santa Clara County.

1.1 ANALYSIS LEVELS

The level of analysis is dependent on the time horizon and level of specificity for the proposed project components. The High School will be constructed in the near future, and the number of students it will accommodate has been determined. Therefore it is evaluated as a stand-alone project (project-level analysis) at a greater level of detail than the remaining components. The types of land uses, their sizes, and timing for the rest of the SEQ Area Project are not yet known. Therefore they will be evaluated in a more general manner (program-level analysis). The scope of each analysis is summarized as follows:

- **The project-level analysis** focuses on the key intersections and freeway segments near the High School site. The High School is proposed to be developed in three phases, with the total student capacity estimated to reach 600 students by 2023, 1,200 students by 2039, and 1,600 at full buildout of the school by 2054. To be conservative, full buildout of the 1,600-student High School is evaluated under the Project scenarios.
- **The program-level analysis** focuses on key roadway and freeway segments in and around the SEQ Area Project. As specific development projects are identified, more detailed project-level transportation analyses of intersections and freeway segments would be conducted, as appropriate.

1.1.1 PROJECT-LEVEL ANALYSIS COMPONENTS

The project-level analysis locations include study intersections (See **Figure 1**) and freeway segments evaluated during the AM (7 to 9 am) and PM (4 to 6 pm) peak periods.

1.1.1.1 Study Intersections

The analysis for the High School project evaluated the operations of the key intersections listed below, which were selected based on the amount of traffic estimated to be added by the proposed High School:

1. Dunne Avenue/US 101 southbound ramps
2. Dunne Avenue/US 101 northbound ramps
3. Dunne Avenue/Condit Road
4. Dunne Avenue/Murphy Avenue
5. Tennant Avenue/Butterfield Boulevard
6. Tennant Avenue/Juan Hernandez Drive

7. Tennant Avenue/US 101 southbound ramps
8. Tennant Avenue/US 101 northbound ramps
9. Tennant Avenue/Condit Road
10. Tennant Avenue/Murphy Avenue
11. Barrett Avenue/Murphy Avenue

None of the intersections analyzed for this report are designated Congestion Management Program (CMP) intersections. The three intersections providing site access are analyzed separately and presented in Site Access discussion in **Chapter 7**.

1.1.1.2 Freeway Segments

The project-level analysis also evaluated the operations of the following key freeway segments:

A. US 101 south of Tennant Avenue
B. US 101 between Tennant Avenue and Dunne Avenue
C. US 101 between Dunne Avenue and Cochrane Avenue
D. US 101 north of Cochrane Avenue

1.1.2 PROGRAM-LEVEL ANALYSIS COMPONENTS

The program-level analysis locations include study roadway and freeway segments (See **Figure 1**) evaluated during the AM (7 to 9 am) and PM (4 to 6 pm) peak periods.

1.1.2.1 Study Roadway Segments

The roadway segments included in the program–level analysis are:

1. Dunne Avenue west of US 101
2. Dunne Avenue over US 101
3. Dunne Avenue between US 101 and Condit Road
4. Dunne Avenue between Condit Road and Murphy Avenue
5. Dunne Avenue between Murphy Avenue and Hill Road
6. Tennant Avenue west of US 101
7. Tennant Avenue over US 101
8. Tennant Avenue between US 101 and Condit Road
9. Tennant Avenue between Condit Road and Murphy Avenue
10. Tennant Avenue between Murphy Road and Hill Road

11. Tennant between Hill Road and Foothill Avenue
12. Murphy between Dunne Avenue and San Pedro Avenue
13. Murphy Avenue between San Pedro Avenue and Barrett Avenue
14. Murphy Avenue between Barrett Avenue and Tennant Avenue
15. Murphy Avenue between Tennant Avenue and Fisher Avenue
16. Murphy Avenue between Fisher Avenue and Maple Avenue
17. Murphy Avenue between Maple Avenue and Middle Avenue
18. Barrett Avenue east of Murphy Avenue
19. Hill Road between Dunne Avenue and Tennant Avenue
20. Hill Road between Tennant Avenue and Maple Avenue
21. Maple Avenue between Murphy Avenue and Foothill Avenue
22. Foothill Avenue between Tennant Avenue and Maple Avenue
23. Foothill Avenue between Maple Avenue and Middle Avenue

1.1.2.2 Study Freeway Segments

The freeway segments are the same segments evaluated for the project-level analysis:

A. US 101 south of Tennant Avenue
B. US 101 between Tennant Avenue and Dunne Avenue
C. US 101 between Dunne Avenue and Cochrane Avenue
D. US 101 north of Cochrane Avenue

1.1.3 ANALYSIS SCENARIOS

The operations of the key intersections, roadway segments, and freeway segments were evaluated for the scenarios listed below. Intersection operations were evaluated with the proposed high school only. Roadway segment operations were evaluated with the entire project description (including the SRL land uses, four programmatic project sites, and the high school). Freeway segment operations were evaluated separately for the high school and the remaining SEQ uses.

Scenario 1: Existing Conditions – Existing volumes obtained from counts.

Scenario 2: Existing Plus Project Conditions – Scenario 1 traffic conditions plus traffic from the proposed project.

Scenario 3: Year 2030 Current General Plan No Project Conditions – Year 2030 cumulative traffic volumes based on City provided land use that includes approved and pending development projects, plus Year 2030 roadway improvements.

Scenario 4: Year 2030 Current General Plan Plus Project Conditions – Scenario 3 traffic conditions plus traffic from the proposed project.

Scenario 5: Year 2030 Cumulative General Plan Plus Project Conditions – Scenario 4 with all other pending general plan amendments.

1.2 TRAFFIC ANALYSIS METHODS

The operations of roadway facilities are described with the term level of service (LOS). LOS is a qualitative description of traffic flow based on such factors as speed, travel time, delay, and freedom to maneuver. Six levels are defined from LOS A, with the best operating conditions, to LOS F, with the worst operating conditions. LOS E represents "at-capacity" operations. Operations are designated as LOS F when volumes exceed capacity, resulting in stop-and-go conditions. Transportation facilities are evaluated during the AM (7 to 9 am) and PM (4 to 7 pm) peak periods.

1.2.1 SIGNALIZED INTERSECTIONS ANALYSIS METHOD

The LOS analysis method for signalized intersections approved by the City of Morgan Hill and VTA analyzes intersection operations based on average control vehicular delay, as described in Chapter 16 of the *2000 Highway Capacity Manual* (*HCM*) published by the Transportation Research Board, with adjusted saturation flow rates to reflect conditions in Santa Clara County. Control delay includes initial deceleration delay, queue move-up time, stopped delay, and final acceleration delay. The average control delay for signalized intersections is calculated using the TRAFFIX analysis software and is correlated to a LOS designation as shown in **Table 1**.

1.2.2 UNSIGNALIZED INTERSECTIONS ANALYSIS METHOD

Operations of the unsignalized study intersections are evaluated using the method contained in Chapter 17 of the 2000 HCM and calculated using the TRAFFIX analysis software. LOS ratings for stop-sign controlled intersections are based on the average control delay expressed in seconds per vehicle. At two-way or side-street-stop controlled intersections, control delay is calculated for each movement, not for the intersection as a whole. For approaches composed of a single lane, delay is computed as the average of

all movements in that lane. For all-way stop-controlled locations, a weighted average delay for the entire intersection is presented. **Table 2** summarizes the relationship between delay and LOS for unsignalized intersections.

TABLE 1: SIGNALIZED INTERSECTION LOS CRITERIA

Level of Service	Description	Delay in Seconds
A	Progression is extremely favorable and most vehicles arrive during the green phase. Most vehicles do not stop at all. Short cycle lengths may also contribute to low delay.	< 10.0
B	Progression is good, cycle lengths are short, or both. More vehicles stop than with LOS A, causing higher levels of average delay.	> 10.0 to 20.0
C	Higher congestion may result from fair progression, longer cycle lengths, or both. Individual cycle failures may begin to appear at this level, though many still pass through the intersection without stopping.	> 20.0 to 35.0
D	The influence of congestion becomes more noticeable. Longer delays may result from some combination of unfavorable progression, long cycle lengths, or high volume-to-capacity (V/C) ratios. Many vehicles stop, and the proportion of vehicles not stopping declines. Individual cycle failures are noticeable.	> 35.0 to 55.0
E	This level is considered by many agencies to be the limit of acceptable delay. These high delay values generally indicate poor progression, long cycle lengths, and high V/C ratios. Individual cycle failures are frequent occurrences.	> 55.0 to 80.0
F	This level is considered unacceptable with oversaturation, which is when arrival flow rates exceed the capacity of the intersection. This level may also occur at high V/C ratios below 1.0 with many individual cycle failures. Poor progression and long cycle lengths may also be contributing factors to such delay levels.	> 80.0

Source: *Traffic Level of Service Analysis Guidelines*, VTA Congestion Management Program, June 2003; *Highway Capacity Manual*, Transportation Research Board, 2000.

TABLE 2: UNSIGNALIZED INTERSECTION LEVEL OF SERVICE DEFINITIONS

Level of Service	Description	Delay in Seconds
A	Little or no delay.	≤ 10.0
B	Short traffic delays.	10.1 to 15.0
C	Average traffic delays.	15.1 to 25.0
D	Long traffic delays.	25.1 to 35.0
E	Very long traffic delays.	35.1 to 50.0
F	Extreme traffic delays with intersection capacity exceeded.	> 50.0

Source: *Highway Capacity Manual*, Transportation Research Board, 2000.

1.2.3 ROADWAY SEGMENT ANALYSIS METHOD

Roadway segments in Morgan Hill were analyzed using comparison of the peak hour volume to threshold volumes for various roadway types presented in **Table 3**

TABLE 3: ROADWAY SEGMENT LEVEL OF SERVICE DEFINITIONS

Roadway Type	Maximum Peak Hour Volume (both directions)				
	LOS A	LOS B	LOS C	LOS D	LOS E
2-Lane Undivided Arterial	n/a[1]	n/a[1]	910	1,670	1,770
2-Lane Divided Arterial	n/a[1]	n/a[1]	970	1,760	1,870
4-Lane Divided Arterial	n/a[1]	n/a[1]	1,920	3,540	3,740
5-Lane Divided Arterial	n/a[1]	n/a[1]	2,260	4,430	4,670
6-Lane Divided Arterial	n/a[1]	n/a[1]	2,710	5,320	5,600
2-Lane Rural Road	310	620	940	1,320	1,560
2-Lane Collector	260	520	780	1,100	1,290

Notes:
1. For local and collector roadway segments, the capacity limitation is related to neighborhood quality of life rather than the physical carrying capacity of the road. This assumes a standard suburban neighborhood, 40-foot roadway width, and 25 mile per hour speed limit with normal speed violation rates.
2. LOS A and B are not achievable for arterial roadways using the HCM 2000 method

Source: *Highway Capacity Manual*, Transportation Research Board, 2000.

1.2.4 VTA FREEWAY SEGMENT ANALYSIS METHOD

Freeway segments are evaluated using VTA's analysis procedure, which is based on the density of the traffic flow using methods described in the *2000 HCM*. Density is expressed in passenger cars per mile per lane. The Congestion Management Program range of densities for freeway segment level of service is shown in **Table 4**.

TABLE 4: FREEWAY SEGMENT LEVEL OF SERVICE DEFINITIONS

Level of Service	Density (passenger cars per mile per lane)
A	≤ 11
B	11.1 to 18.0
C	18.1 to 26.0
D	26.1 to 46.0
E	46.1 to 58.0
F	Extreme traffic delays with intersection capacity exceeded.

Source: *Traffic Level of Service Analysis Guidelines*, VTA Congestion Management Program, June 2003; *Highway Capacity Manual*, Transportation Research Board, 2000.

1.3 LOS STANDARDS AND IMPACT THRESHOLDS

The LOS standards and impact thresholds for the City of Morgan Hill and VTA as they apply to this report are discussed below.

1.3.1 MORGAN HILL GENERAL PLAN CIRCULATION ELEMENT LOS POLICY

Per its *General Plan* (February 2010), the City of Morgan Hill currently maintains the following tiered approach for minimum acceptable levels of service at intersections:

> **LOS F** in the Downtown including intersections along Monterey Road between Main and Fifth Streets, and along Depot Street at First through Fifth Streets;
>
> **LOS E** for the following intersections and freeway zones:
>
> Intersections:

- Main Avenue/Del Monte Avenue
- Main Avenue/Depot Street
- Dunne Avenue/Del Monte Avenue
- Dunne Avenue/Monterey Avenue
- Dunne Avenue/Church Street; also until closed: Dunne Avenue/Depot Street
- Cochrane Road/Monterey Road
- Tennant Avenue/Monterey Road
- Tennant Avenue/Butterfield Boulevard

Freeway Zones:

- Cochrane Road from Madrone Parkway-Cochrane Plaza to DePaul Drive
- Dunne Avenue from Walnut Grove Drive to Condit Road
- Tennant Avenue from Butterfield Boulevard to Condit Road
- All US 101 Freeway Ramps (such as Dunne Avenue/US 101 Southbound Ramps)

LOS D for all remaining intersections and roadway segments in the City.

1.3.2 INTERSECTION LOS STANDARDS

Based on the above approach, the following signalized study intersections shown on **Figure 1** would have a minimum acceptable threshold of LOS E:

- Dunne Avenue/US 101 southbound ramps (#1)
- Dunne Avenue/US 101northbound ramps (#2)
- Dunne Avenue/Condit Road (#3)
- Tennant Avenue/Butterfield Boulevard (#5)
- Tennant Avenue/Juan Hernandez Drive (#6)
- Tennant Avenue/US 101 southbound ramps (#7)
- Tennant Avenue/US 101 northbound ramps (#8)

The following signalized intersection would have a minimum acceptable threshold of LOS D:

- Dunne Avenue/Murphy Avenue (#4)

The City has generally used a minimum acceptable operating level of LOS D for unsignalized intersections; therefore, the following unsignalized study intersections would have a minimum acceptable threshold of LOS D.

- Tennant Avenue/Murphy Avenue (#10)
- Barrett Avenue/Murphy Avenue (#11)

The following unsignalized intersection would have a minimum acceptable threshold of LOS E, since it falls within the Tennant Avenue freeway zone:

- Tennant Avenue/Condit Road (#9)

For unsignalized intersection both the LOS threshold and peak hour signal warrant analysis is used to identify significant traffic impacts.

1.3.3 ROADWAY SEGMENT LOS STANDARD

The City of Morgan Hill does not have a formally adopted roadway segment operating standard. Thus, for the purposes of this analysis and to be consistent with planning efforts in Morgan Hill and other jurisdictions, LOS D was used as a guideline for the long-range planning evaluation of peak hour segment volumes for all roadway segments, except for the freeway zones on Dunne Avenue (Walnut Grove Drive to Condit Road) and Tennant Avenue (Butterfield Boulevard to Condit Road), which were evaluated based on a LOS E standard.

1.3.4 FREEWAY LOS STANDARD

According to VTA's *Transportation Impact Analysis Guidelines* (VTA, 2009) a freeway segment analysis should be included if the project meets one of the following requirements:

1. The proposed development project is expected to add traffic equal to at least one percent of a freeway segment's capacity.
2. The proposed development project is adjacent to one of the freeway segment's access or egress points
3. Based on engineering judgment, Lead Agency staff determines that the freeway segment should be included in the analysis.

For mixed-flow lanes, freeway segment capacities are defined as 2,200 vehicles per hour per lane (vphpl) for four-lane freeway segments and 2,300 vphpl for six-lane freeway segments. HOV lane capacities are defined between 1,800 to 1,900 vphpl. The VTA's LOS standard for freeway segments is LOS E.

1.4 IMPACT CRITERIA

Intersection and roadway segment impacts were evaluated by comparing operations for the following pairs of conditions:

- Existing Plus Project Conditions (Scenario 2) to Existing Conditions (Scenario 1)
- 2030 General Plan Plus Project Conditions (Scenario 4) to 2030 General Plan No Project Conditions (Scenario 3)

Intersection and roadway segment operations under 2030 Cumulative General Plan Conditions are presented for informational purposes only to identify the cumulative effects of all proposed GPAs in the City of Morgan Hill. The City's travel demand forecasting model was used to estimate traffic volumes for the 2030 scenarios under Scenarios 3 and 5.

Freeway impacts were evaluated following VTA guidelines and were assessed by adding project trips to freeway volumes established under Existing Conditions (Scenario 1). Project impacts on bicycle, pedestrian, and transit facilities and services were also addressed.

1.4.1 SIGNALIZED INTERSECTION IMPACT CRITERIA

The City of Morgan Hill has adopted the signalized intersection impact criteria as defined by the VTA; therefore, traffic impacts at City of Morgan Hill intersections would occur when the addition of traffic associated with implementation of the Project causes:

1. Intersection operations to deteriorate from an acceptable level under Existing Conditions to an unacceptable level; or,
2. Exacerbation of unacceptable operations under Existing Conditions by increasing the average critical delay by more than 4 seconds and increasing the critical volume-to-capacity (V/C) ratio by 0.01 or more at an intersection operating unacceptable LOS (LOS E or F depending on study location) under Project Conditions; or,
3. The V/C ratio increases by 0.01 or more at an intersection with unacceptable operations (LOS E or F depending on study location) when the change in critical delay is negative (i.e., decreases). This can occur if the critical movements change.[1]

[1] Generally, critical movements are a pair of conflicting movements for each street that that have the highest volume-to-saturation ratio or green time-to-cycle length ratio. As volumes at intersections change, the critical movements can change.

1.4.2 UNSIGNALIZED INTERSECTION IMPACT CRITERIA

Level of service analysis at unsignalized intersections is generally used to determine the need for modifying intersection control type (i.e., all-way stop or signalization). As part of this evaluation, traffic volumes, delays, and traffic signal warrants were evaluated to determine if the existing intersection control is appropriate.

Significant impacts are defined to occur when an approach for two-way stop control or the intersection for all-way stop controlled locations operates at an unacceptable level (LOS E or F for most unsignalized study locations) and the peak hour signal warrant from the Manual on Uniform Traffic Control Devices (MUTCD) is met or exceeded under "plus project" conditions.

1.4.3 ROADWAY SEGMENT IMPACT CRITERIA

Roadway segment impacts are defined to occur when the addition of traffic from the proposed GPAs causes:

1. Roadway segment operations to deteriorate from an acceptable level (LOS D or better) under Existing or 2030 Baseline Conditions to an unacceptable level (LOS E or worse); or
2. An increase in volume of one (1) percent in the capacity of a roadway segment that is already operating already operating unacceptably (LOS E or worse) under Existing or 2030 Baseline Conditions.

1.4.4 FREEWAY SEGMENT IMPACT CRITERIA

The implementation of the Proposed Project would result in a significant impact if the addition of project traffic on a freeway segment exceeded one of the following thresholds:

1. The addition of project traffic causes the operating level of a freeway segment to deteriorate from LOS E or better under Existing Conditions to LOS F; or
2. The number of new trips added by a Proposed Project to a segment already operating at LOS F under Existing Conditions is more than one percent of the freeway segment capacity

1.5 REPORT ORGANIZATION

The remainder of this report is divided into the following chapters.

- **Chapter 2** describes the existing transportation system serving the SEQ Area, including the operating conditions of study intersections, roadway segments, and freeway segments.

- **Chapter 3** describes Existing Plus Project Conditions, including the method used to estimate the amount of traffic added to the surrounding roadways by the proposed High School and the remaining SEQ Area Project uses and their impacts on the transportation system.
- **Chapter 4** describes Year 2030 Current General Plan Conditions and Year 2030 Current General Plan with Project Conditions
- **Chapter 5** describes Year 2030 Cumulative with Project Conditions.
- **Chapter 6** presents a summary of the significant impacts and describes the associated mitigation measures
- **Chapter 7** includes an assessment of the high school's site plan regarding vehicular, pedestrian, and bicycle access

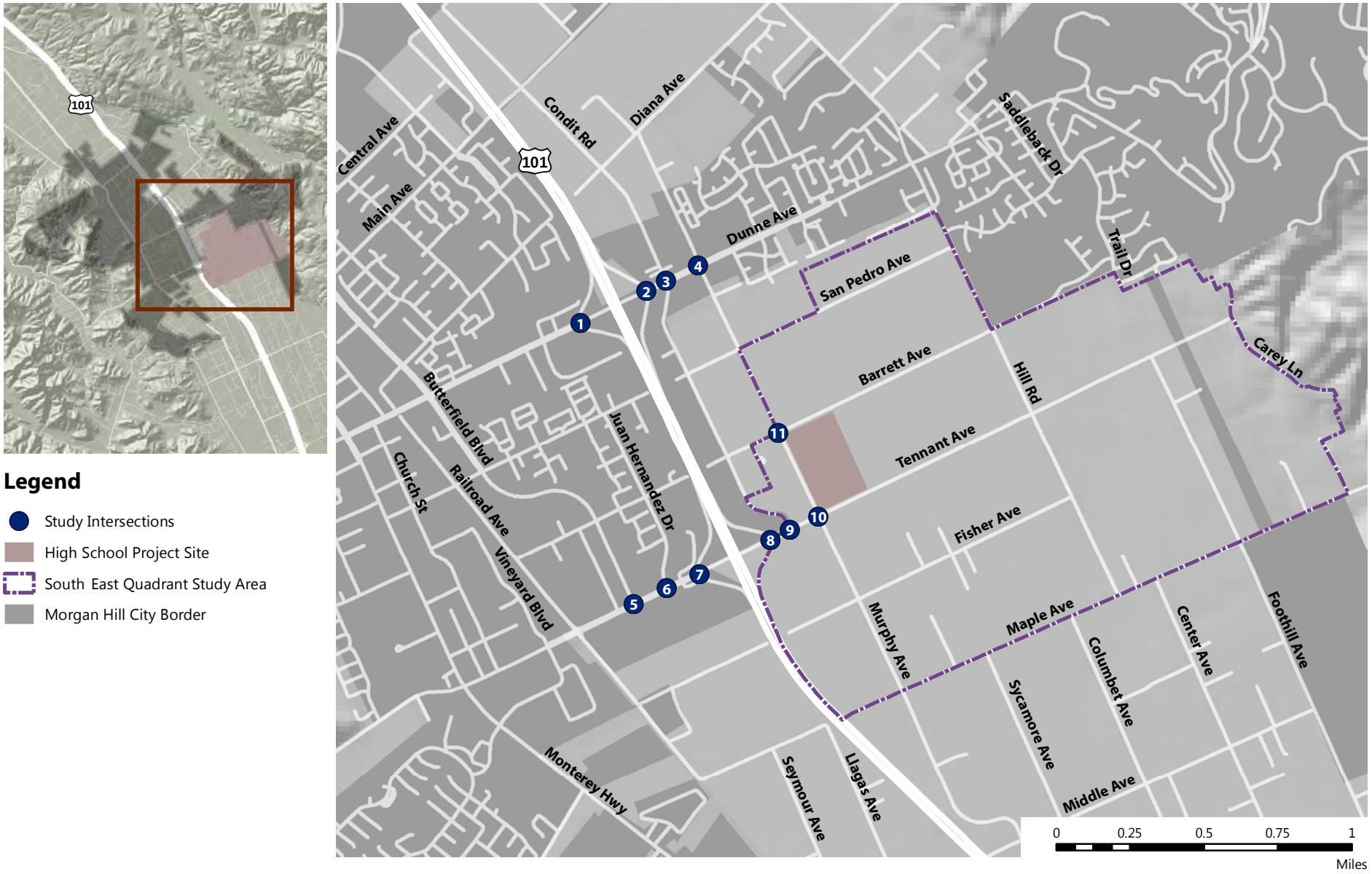

Figure 1

Study Area and Study Intersections

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Figure 2

Study Area and Study Roadway Segments

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2.0 EXISTING CONDITIONS

This chapter describes the existing roadway facilities, pedestrian and bicycle facilities, transit service, traffic volumes, and intersection, roadway segment, and freeway segment operations.

2.1 EXISTING ROADWAY NETWORK

This section describes the existing roadway network near the project area, which is illustrated on **Figure 1**. Regional access to the site is provided via US 101 and local access is provided via Dunne Avenue, Tennant Avenue, Condit Road, Murphy Avenue, Hill Road, Foothill Avenue, and Barrett Avenue. Each of these roadways is described below:

United States Highway 101 (US 101) is a north-south freeway that serves as the primary roadway connection between Morgan Hill and all other areas of Santa Clara County. US 101 extends north to San Francisco and south to Los Angeles. The freeway includes six lanes (three mixed-flow lanes in each direction) within most of Morgan Hill. North of Cochrane Road, US 101 widens to eight lanes (three mixed-flow lanes and one high occupancy vehicle (HOV) lane in each direction). The Dunne Avenue and Tennant Avenue interchanges provide access to the project area.

Dunne Avenue is an east-west, four-lane, divided arterial roadway north of the project site. This street extends through Morgan Hill from De Witt Avenue in the west to Holiday Drive in the east. Dunne Avenue provides access for commercial, industrial, and residential uses along its length.

Tennant Avenue is an east-west arterial roadway south of Dunne Avenue, running through the SEQ Area. Between Monterey Road and Hill Road, Tennant Avenue is designated a four-lane, divided arterial. East of Hill Road up to Foothill Avenue, Tennant Avenue is designated a collector street. Beyond Foothill Avenue to the east, Tennant Avenue is a local street. Tennant Avenue provides access for commercial, industrial, and residential uses along its length. The proposed high school includes a new driveway on Tennant Avenue just to the east of Murphy Avenue.

Condit Road is a north-south, two-lane roadway, running parallel to US 101 between Tennant Avenue and Half Road. Between Dunne Avenue and Tennant Avenue, Condit Road provides access to a variety of commercial and recreational uses.

Murphy Avenue is a north-south, two-lane roadway, running parallel to US 101 to the east of Condit Road. Murphy Avenue mainly runs through rural areas, connecting some limited industrial, commercial, and

residential uses. The proposed high school includes a new driveway on Murphy Avenue in between Tennant Avenue and Barrett Avenue.

Hill Road is a north-south, two-lane roadway, running parallel to US 101 to the east of Murphy Avenue. Between Dunne Avenue and Tennant Avenue, Hill Road mainly runs through rural areas, connecting some limited agricultural, commercial, and residential uses.

Foothill Avenue is a north-south, two-lane roadway, to the east of Hill Road. Foothill Avenue extends south of Tennant Avenue and provides access to some limited industrial, commercial, and residential uses.

Barrett Avenue is an east-west, two-lane roadway, located between and parallel to Dunne Avenue and Tennant Avenue. Barrett Avenue has segments on either side of US 101, but does not cross US 101. On the eastern side of US 101, Barrett Avenue runs from Condit Road to Trail Drive. The proposed high school includes a new driveway on Barrett Avenue just to the east of Murphy Avenue.

2.2 EXISTING PEDESTRIAN AND BICYCLE FACILITIES

The mild climate, relatively flat terrain, and proximity of many recreational and non-recreational destinations provide an ideal environment for walking and bicycling in the City of Morgan Hill. This section describes the existing pedestrian and bicycle infrastructure.

2.2.1 PEDESTRIAN FACILITIES

Pedestrian facilities comprising sidewalks, crosswalks, and pedestrian signals are generally provided at all of the signalized study intersections. Continuous sidewalks are provided on the northern side of Dunne Avenue. No sidewalks are provided on Murphy Avenue between Dunne Avenue and Tennant Avenue; however this is a primarily rural area without signalized intersections.

2.2.2 BICYCLE FACILITIES

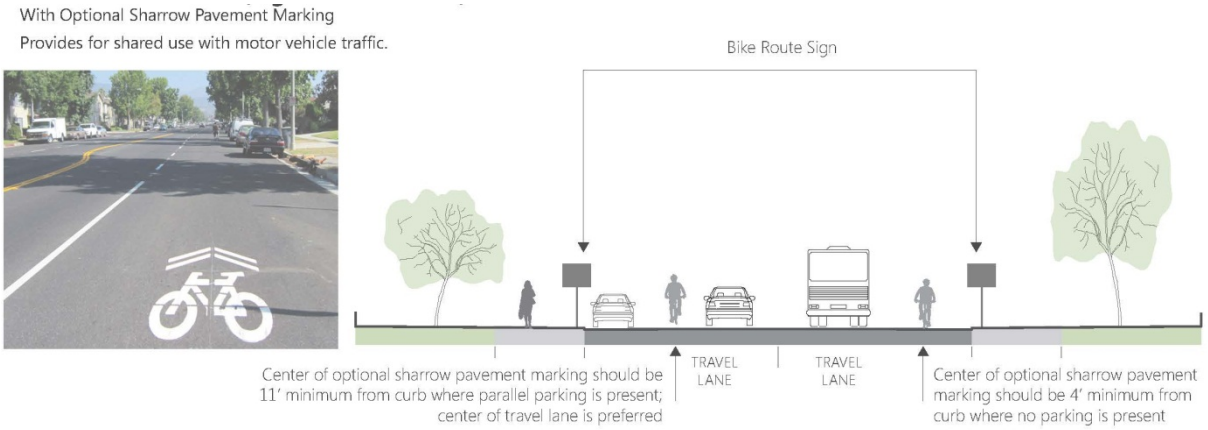
Bikeway planning and design in California typically relies on the guidelines and design standards established by Caltrans in the *Highway Design Manual* (Chapter 1000: Bikeway Planning and Design, 6th Edition, California Department of Transportation, January 2012). Chapter 1000 follows standards developed by the American Association of State Highway and Transportation Officials (AASHTO) and the Federal Highway Administration (FHWA), and identifies specific design standards for various conditions and bikeway-to-roadway relationships. Under California law, bicyclists are allowed to use all roadways in California unless posted closed to cyclists.

Caltrans standards provide for three distinct types of bikeway facilities, as generally described below and shown on the accompanying illustrations.

- *Class I Bikeway (Bike Path)* provides a completely separate right-of-way and is designated for the exclusive use of bicycles and pedestrians with vehicle and pedestrian cross-flow minimized. In general, bike paths serve corridors not served by streets and highways or where sufficient right-of-way exists to allow such facilities to be constructed away from the influence of parallel streets and numerous vehicle conflicts.

- *Class II Bikeways (Bike Lanes)* are lanes for bicyclists generally adjacent to the outer vehicle travel lanes. These lanes have special lane markings, pavement legends, and signage. Bicycle lanes are generally five (5) feet wide. Adjacent vehicle parking and vehicle/pedestrian cross-flow are permitted.

- *Class III Bikeway (Bike Route)* are designated by signs or pavement markings for shared use with pedestrians or motor vehicles, but have no separated bike right-of-way or lane striping. Bike routes serve either to: a) provide continuity to other bicycle facilities, or b) designate preferred routes through high demand corridors.



The *VTA Bicycle Technical Guidelines* (December 2007) recommends that Caltrans standards regarding bicycle facility dimensions be used as a minimum and provides supplemental information and guidance on when and how to better accommodate the many types of bicyclists.

Figure 2 shows the existing bicycle facilities near the project area. No Class I bike paths exist in the project vicinity. A Class II bike lane is located along Dunne Avenue between Murphy Avenue and Hill Road and connects to existing Class III bike routes on either end. Class III bike routes also exist on Murphy Avenue between Middle Avenue and Diana Avenue, Hill Road between Main Avenue to south of San Martin, and Condit Road between Half Road and Tennant Avenue.

2.2.3 EXISTING TRANSIT SERVICE

The VTA operates fixed route local, express (commuter), paratransit bus, and light rail transit (LRT) service in Santa Clara County. The Peninsula Corridor Joint Powers Board operates Caltrain commuter rail service between San Francisco and San Jose, with weekday commute-hour service to Morgan Hill and Gilroy. The Morgan Hill Caltrain station is located in downtown Morgan Hill. Monterey Salinas Transit (MST) operates transit service in Monterey County, and provides express bus service to Morgan Hill and San Jose. Existing transit service near the project site is illustrated on **Figure 3**. Currently there are no VTA or Monterey Salinas Transit (MST) bus (or LRT) routes that serve the project area. The nearest VTA bus route to the SEQ area is Route 16, which follows Main Avenue on the east side of US 101. Route 16 is a Community Bus Service Route that serves various destinations in the Morgan Hill area, including the Civic Center, Live Oak High School, Madrone Village Shopping Center, and Sobrato High School. The route operates on weekdays, with three trips in each direction during the morning and four trips in each direction in the afternoon and evening. MST bus route 55 travels along US 101 adjacent to the project area, but stops only at the Morgan Hill Caltrain station. The route operates 7 days a week, with three trips in each direction each day.

Caltrain provides frequent daily train service between San Jose and San Francisco. Service extends south to Morgan Hill and Gilroy during commute hours, with three northbound trips during the AM peak period and three southbound trips during the PM peak period stopping at both the Gilroy and Morgan Hill Caltrain Stations. **Table 5** summarizes hours of operation and service frequencies for the Caltrain service in Morgan Hill.

TABLE 5: EXISTING CALTRAIN TRANSIT SERVICE

Route	From	To	Weekdays		Weekends	
			Operating Hours	Headway[1]	Operating Hours	Headway[1]
Caltrain[2]	San Francisco (4th & King)	Gilroy	6:07a-7:39a 4:52p-7:47p	3 Trains each NB in AM and SB in PM	No Service	

Notes:
1. Headways are defined as the time interval between two transit vehicles traveling in the same direction over the same route.
2. Operating hours reflect service to and from Gilroy.

Source: VTA, Caltrain, January 2013.

2.3 EXISTING INTERSECTION VOLUMES AND LANE CONFIGURATIONS

The operations of the study intersections were evaluated during the weekday AM and PM peak hours. Intersection operations were evaluated for the highest one-hour volume counted in each peak period – AM between 7 and 9 am and PM between 4 and 7 p.m. The intersection turning movement counts were conducted within the last two (2) years and where either collected for this study or compiled from available reports. The traffic count summaries are included in **Appendix A**.

Figure 4 presents the existing AM and PM peak-hour turning movement volumes, the existing lane configurations, and traffic control devices for the 11 existing study intersections.

Figure 3

Existing Bicycle Routes

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Figure 4

Existing Transit Routes

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2.4 EXISTING INTERSECTION LEVELS OF SERVICE

Existing intersection lane configurations, signal timings, and peak-hour turning movement volumes were used as inputs for the LOS calculations. The results of the LOS analysis for Existing Conditions are presented in **Table 6**. **Appendix B** contains the corresponding calculation sheets. Measured against the City of Morgan Hill LOS standards, all of the study intersections are operating at acceptable levels of service during both peak hours under Existing Conditions.

TABLE 6: EXISTING INTERSECTION LEVELS OF SERVICE

Intersection	LOS Standard	Traffic Control	Count Date	Peak Hour	Delay[1]	LOS[2]
1. Dunne Avenue/US 101 Southbound Ramps	E	Signal	9/30/2010	AM PM	16.1 26.2	B C
2. Dunne Avenue/US 101 Northbound Ramps	E	Signal	7/19/2011	AM PM	13.6 15.1	B B
3. Dunne Avenue/Condit Road	D	Signal	6/1/2011	AM PM	31.4 24.0	C C
4. Dunne Avenue/Murphy Avenue	D	Signal	6/1/2011	AM PM	15.1 14.9	B B
5. Tennant Avenue/Butterfield Boulevard	E	Signal	6/1/2011	AM PM	21.7 26.5	C+ C
6. Tennant Avenue/Juan Hernandez Drive	E	Signal	5/25/2011	AM PM	7.1 6.5	A A
7. Tennant Avenue/US 101 Southbound Ramps	E	Signal	5/25/2011	AM PM	21.6 30.1	C+ C
8. Tennant Avenue/US 101 Northbound Ramps	E	Signal	5/25/2011	AM PM	17.7 19.3	B B-
9. Tennant Avenue/Condit Road	E	SSS	5/25/2011	AM PM	11.3 10.9	B B
10. Tennant Avenue/Murphy Avenue	D	AWS	5/25/2011	AM PM	9.3 9.3	A A
11. Murphy Avenue/Barrett Avenue	D	SSS	5/25/2011	AM PM	9.4 9.2	A A

Notes:
1. Whole intersection weighted average control delay expressed in seconds per vehicle calculated using methods described in the 2000 HCM, with adjusted saturation flow rates to reflect Santa Clara County Conditions for signalized intersections. Total control delay for the worst movement is presented for side-street stop-controlled intersections.
2. LOS = Level of service. LOS calculations conducted using the TRAFFIX 8.0 level of service analysis software package.

Source: Fehr & Peers, July 2013.

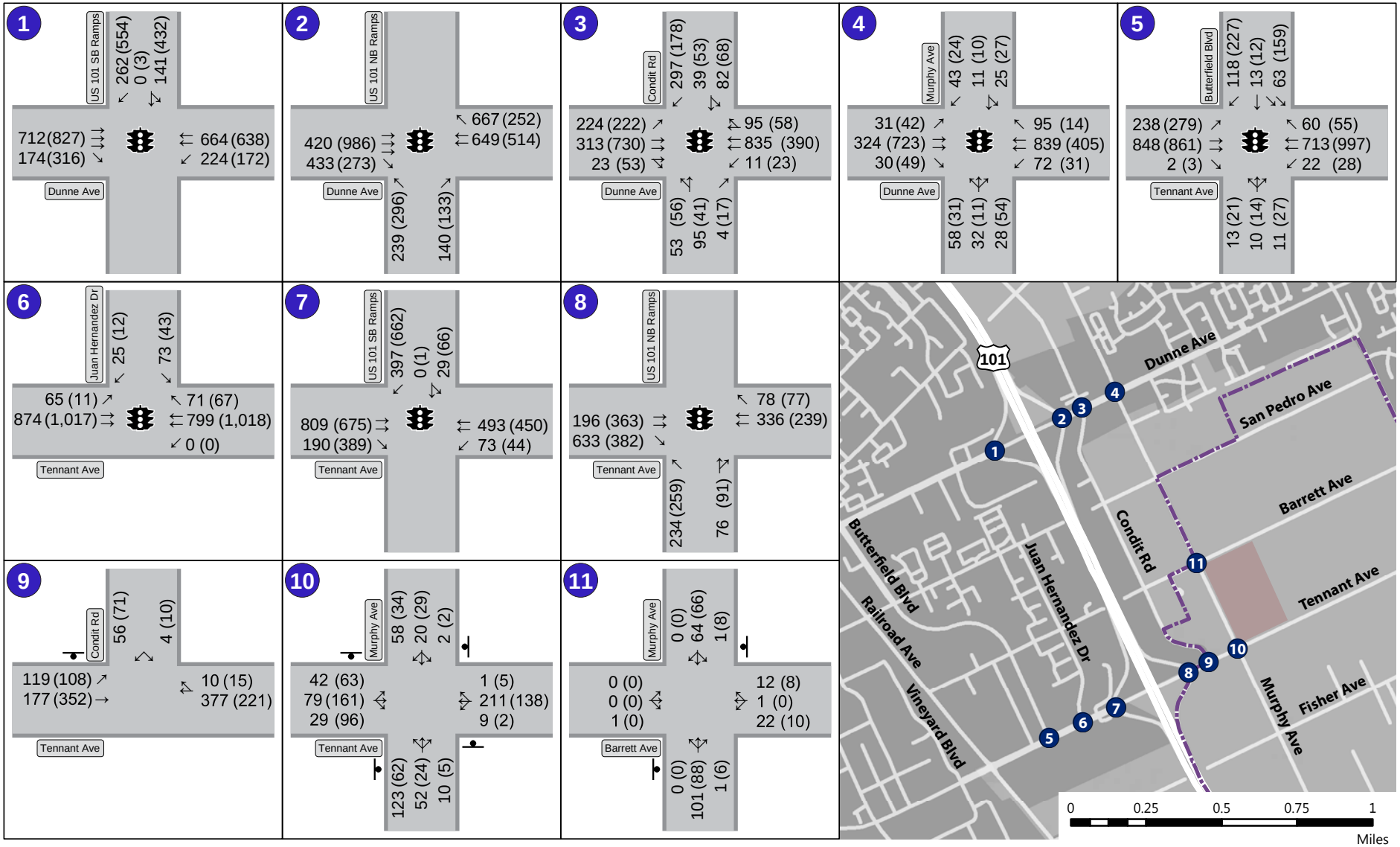

Figure 5

Existing Intersection Peak-Hour Volumes, Traffic Controls, and Geometries

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2.5 FIELD OBSERVATIONS

Field observations of the study intersections were conducted in May 2012 to verify their operations. In general, all of the study intersections are operating at or near the calculated levels of service. Most vehicle queues typically cleared the signalized intersections within one signal cycle. Therefore, no excessive queuing was observed.

2.6 EXISTING ROADWAY SEGMENT LEVELS OF SERVICE

Existing roadway types and peak hour two-way volumes were used as inputs for the LOS calculations. The results of the LOS analysis for Existing Conditions are presented in **Table 7**. **Appendix B** contains the corresponding calculation sheets. Measured against the City of Morgan Hill LOS standards (LOS D for most roadway segments, and LOS E for segments in freeway zones), all of the roadway segments currently operate at an acceptable levels during the AM or PM peak hours.

TABLE 7: EXISTING PEAK HOUR TWO-WAY ROADWAY SEGMENT LEVELS OF SERVICE

Roadway Segment	Roadway Type	Peak Hour	Traffic Volume	LOS
1. Dunne Avenue west of US 101	4-Lane Divided Arterial	AM PM	1,812 2,335	C D
2. Dunne Avenue over US 101	5-Lane Divided Arterial	AM PM	1,741 2,069	C C
3. Dunne Avenue between US 101 and Condit Road	6-Lane Divided Arterial	AM PM	1,745 1,629	C C
4. Dunne Avenue between Condit Road and Murphy Avenue	5-Lane Divided Arterial	AM PM	1,325 1,274	C C
5. Dunne Avenue between Murphy Avenue and Hill Road	4-Lane Divided Arterial	AM PM	1,383 1,254	C C
6. Tennant Avenue west of US 101	4-Lane Divided Arterial	AM PM	1,889 2,176	C D
7. Tennant Avenue over US 101	4-Lane Divided Arterial	AM PM	1,403 1,248	C D
8. Tennant Avenue between US 101 and Condit Road	4-Lane Divided Arterial	AM PM	729 752	C C
9. Tennant Avenue between Condit Road and Murphy Avenue	2-Lane Undivided Arterial	AM PM	461 555	C C
10. Tennant Avenue between Murphy Road and Hill Road	2-Lane Undivided Arterial	AM PM	312 313	C C

TABLE 7: EXISTING PEAK HOUR TWO-WAY ROADWAY SEGMENT LEVELS OF SERVICE

Roadway Segment	Roadway Type	Peak Hour	Traffic Volume	LOS
11. Tennant between Hill Road and Foothill Avenue	2-Lane Undivided Arterial	AM PM	127 117	A A
12. Murphy between Dunne Avenue and San Pedro Avenue	2-Lane Undivided Arterial	AM PM	231 186	C C
13. Murphy Avenue between San Pedro Avenue and Barrett Avenue	2-Lane Undivided Arterial	AM PM	178 170	C C
14. Murphy Avenue between Barrett Avenue and Tennant Avenue	2-Lane Undivided Arterial	AM PM	189 170	C C
15. Murphy Avenue between Tennant Avenue and Fisher Avenue	2-Lane Undivided Arterial	AM PM	243 218	C C
16. Murphy Avenue between Fisher Avenue and Maple Avenue	2-Lane Undivided Arterial	AM PM	222 247	C C
17. Murphy Avenue south of Maple Avenue	2-Lane Undivided Arterial	AM PM	136 135	C C
18. Barrett Avenue east of Murphy Avenue	2-Lane Rural Road	AM PM	37 32	A A
19. Hill Road between Dunne Avenue and Tennant Avenue	2-Lane Undivided Arterial	AM PM	95 82	C C
20. Hill Road between Tennant Avenue and Maple Avenue	2-Lane Collector Road	AM PM	413 355	B B
21. Maple Avenue between Murphy Avenue and Foothill Avenue	2-Lane Rural Road	AM PM	152 107	A A
22. Foothill Avenue between Tennant Avenue and Maple Avenue	2-Lane Collector Road	AM PM	114 95	A A
23. Foothill Avenue between Maple Avenue and Middle Avenue	2-Lane Collector Street	AM PM	98 119	A A

Notes:
1. LOS = Level of service based on two-way peak hour traffic.
Source: Fehr & Peers, July 2013.

2.7 EXISTING FREEWAY SEGMENT LEVELS OF SERVICE

Freeway segment densities reported in the latest (2011) VTA's *Monitoring and Conformance Report* were used to calculate the existing levels of service for the key freeway segments during the AM and PM peak hours. The results are presented in **Table 8**. All freeway segments operate at or above the VTA's LOS E standard, except for northbound US 101 between Tennant Avenue and Dunne Avenue during the AM peak hour.

TABLE 8: US-101 FREEWAY SEGMENT LEVELS OF SERVICE

Direction	From	To	Peak Hour	Lanes		Density[1]		LOS[2]	
				Mixed	HOV	Mixed	HOV	Mixed	HOV
NB US 101	San Martin Avenue	Tennant Avenue	AM PM	3 3	0 0	55 20	N/A	E C	N/A
	Tennant Avenue	Dunne Avenue	AM PM	3 3	0 0	**65** 18	N/A	**F** B	N/A
	Dunne Avenue	Cochrane Road	AM PM	3 3	0 0	49 22	N/A	E C	N/A
	Cochrane Road	Coyote Creek Golf Drive	AM PM	3 3	1 1	30 20	18 9	D C	B A
SB US 101	Coyote Creek Golf Drive	Cochrane Road	AM PM	3 3	0 0	14 41	N/A	B D	N/A
	Cochrane Road	Dunne Avenue	AM PM	3 3	0 0	13 32	N/A	B D	N/A
	Dunne Avenue	Tennant Avenue	AM PM	3 3	0 0	18 27	N/A	B D	N/A
	Tennant Avenue	San Martin Avenue	AM PM	3 3	0 0	14 30	N/A	B D	N/A

Notes: NB = Northbound, SB = Southbound, N/A = Not applicable. Freeway segment does not have HOV lanes.
1. Measured in passenger cars per mile per lane.
2. LOS = Level of service.
N/A = Not applicable. Freeway segment does not have HOV lanes.
Bold type indicates unacceptable operations (LOS F).
Source: 2011 Monitoring and Conformance Report, VTA June 2012.

3.0 EXISTING PLUS PROJECT CONDITIONS

The impacts of the proposed High School (separately) and the entire SEQ Area Project on the surrounding roadway system are discussed in this chapter. First, the method used to estimate the amount of generated traffic is described. Then, the results of the LOS calculations for Project Conditions are presented. Project Conditions are defined as Existing Conditions plus traffic generated by the Proposed Project. Impacts of the High School are evaluated at the study intersections and freeway segments. Impacts of the entire SEQ Area Project are evaluated at the study roadway segments and freeway segments. A comparison of operations under Existing and Existing Plus Project Conditions is presented to identify the impacts. Impacts to non-automobile modes are also addressed.

3.1 PROJECT TRAFFIC ESTIMATES

The amount of traffic associated with the project was estimated using a three-step process: (1) trip generation, (2) trip distribution, and (3) trip assignment. In the first step, the amount of traffic entering and exiting the project area due to the potential new uses was estimated on a daily and peak-hour basis. In the second step, the directions vehicles use to approach and depart the project area were estimated. The trips were assigned to specific street segments and intersection turning movements in the third step and added to the existing traffic volumes to develop Existing Plus Project traffic volumes. The results of the process for this analysis are described in the following sections.

3.1.1 TRIP GENERATION

Trip generation forecasts for the High School were calculated using the Private High School land use type (Land Use 536) identified in *Trip Generation*, 9th Edition (Institute of Transportation Engineers, 2012). The results are presented in **Table 9**.

The trip generation estimates for the remaining SEQ land uses were estimated based on assumptions about potential land uses allowed within the SEQ area. Specifically, the following ITE land use categories were used to help inform the selected generation rates for the SEQ land uses:

- Sporting Goods Store (ITE 861)
- Medical Office Building (ITE 720)
- Hotel (ITE 310)
- High Turn-Over Restaurant (ITE 932)

- Drive Through Fast-Food (ITE 934)
- Gas Station (ITE 945)
- Multipurpose Recreational Facility (ITE 435)
- Soccer Complex (ITE 488)
- Batting Cages (ITE 433)
- Tennis Courts (ITE 490)
- Golf Driving Range (ITE 432)
- Single Family (ITE 210)

Trip rates were also developed for other allowable recreational uses for which ITE trip generation rates are not available, including baseball fields and equestrian uses. **Table 9** below includes the total trip generation estimates for the SEQ land uses. **Appendix D** includes a detailed trip generation table for all the land uses assumed for the purpose of this analysis.

TABLE 9: PROJECT VEHICLE TRIP GENERATION RATES AND ESTIMATES

Land Use	Size	Daily	AM Peak Hour			PM Peak Hour		
			In	Out	Total	In	Out	Total
High School (Project-level) [A]								
Private High School (536)	1,600 students	3,968	791	505	1,296	117	155	272
	Rates	2.48			0.81			0.17
SEQ Area Project (Program-level) [B]								
SEQ Land Uses[1]	1,290 acres	21,652	495	397	893	1,372	1,010	2,382
	Rates	16.78			0.69			1.85
Total New Trips [A+B]		***25,620***	***1,286***	***902***	***2,189***	***1,489***	***1,165***	***2,654***

Notes:
1. Appendix D includes a detailed trip generation table for all the land uses assumed for the SEQ Area Project.
Source: *Trip Generation*, 9th Edition, Institute of Transportation Engineers and Fehr & Peers, July 2013.

It should be noted that land use assumptions were selected in consultation with City staff and are based on the best available information. The intent of the program-level analysis was to capture a reasonable number of project trips associated with the entire SEQ Area Project. As specific development projects are

identified, only a project-level transportation analysis would be necessary if the total number of trips is within the program-level trip estimates presented in **Table 9**.

Based on the information presented in **Table 9**, the High School would result in 3,968 daily vehicle trips, 1,296 AM peak-hour vehicle trips, and 272 PM peak-hour vehicle trips. The (remaining) program-level SEQ land uses would generate approximately 21,652 daily trips, 893 AM and 2,382 PM peak hour vehicle trips. Thus the entire SEQ project, including the SRL land uses, four programmatic project sites, and High School, would generate approximately 25,620 daily trips, 2,189 AM and 2,654 PM peak hour vehicle trips

3.1.2 TRIP DISTRIBUTION

Trip distribution is defined as the directions of approach and departure that vehicles would use to arrive to and depart from the high school site or project area. Trip distribution percentages were developed based on existing traffic patterns at the study intersections and the locations of complementary land uses. Distribution patterns are expected to be similar for the AM and PM peak periods; although different for High School and the SEQ land uses. The SEQ and High-School generated trips were assigned to the surrounding transportation network based on the general directions of approach and departure illustrated on **Figure 5** and presented below:

	High School	SEQ Land Uses
North on US 101:	45%	40%
South on US 101:	30%	27%
East of Dunne Avenue:	3%	6%
West of US 101:	22%	27%

3.1.3 TRIP ASSIGNMENT

Figure 6 shows the High School trip assignment through the study intersections under Existing Conditions. High School trips were added to existing traffic volumes in **Figure 4** to establish intersection volumes for Existing Plus Project Conditions, as shown on **Figure 7**. The trip assignment for the entire SEQ Area project were added to existing roadway segment and freeway segment volumes to establish Existing Plus Project link level volumes as presented in **Tables 11 and 12B**, respectively.

Figure 6

Trip Distribution for High School and South East Area Project

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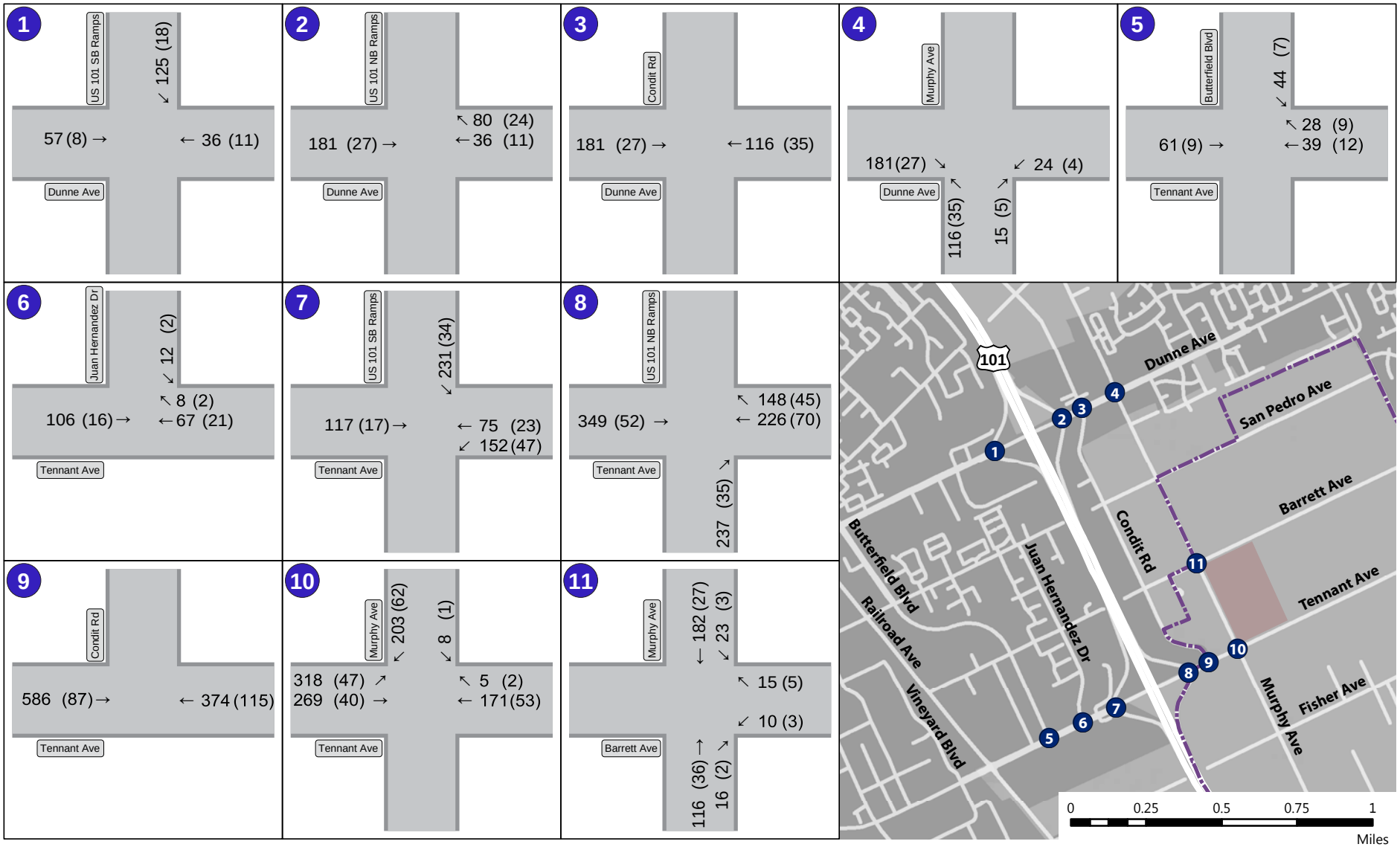

Figure 7

High School Project Trip Assignment

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